THE RIGHT PROFILE?

A REVIEW OF APPROACHES TO DETERMINING PERSONNEL MIX IN HEALTHCARE

A PAPER FOR THE DIVISION OF DEVELOPMENT
OF HUMAN RESOURCES FOR HEALTH OF THE
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1. INTRODUCTION

This paper was commissioned by the Division of Development of Human Resources for Health of the World Health Organisation (WHO). The objectives of the paper are to:

- conduct a literature review of the use of combinations of healthcare staff - specifically two main groups of direct care "providers" (doctors and nurses). The review examines issues of quality and costs of personnel mix in hospital and non hospital settings. Strengths and weaknesses of different approaches to determining and evaluating personnel mix are discussed.

- develop a research design for critical review of the findings of studies of and approaches to determining personnel mix.

This paper is in three further chapters.

Chapter 2 highlights the reasons why achieving the "right" personnel mix is central to the effective and efficient delivery of healthcare and outlines a number of approaches to determining personnel mix.

Chapter 3 provides an overview of literature on personnel mix in healthcare, highlighting key issues for research design.

Chapter 4 describes the design of a research based approach to reviewing approaches to determining personnel mix in healthcare, and the 'piloting' of this approach in practice.

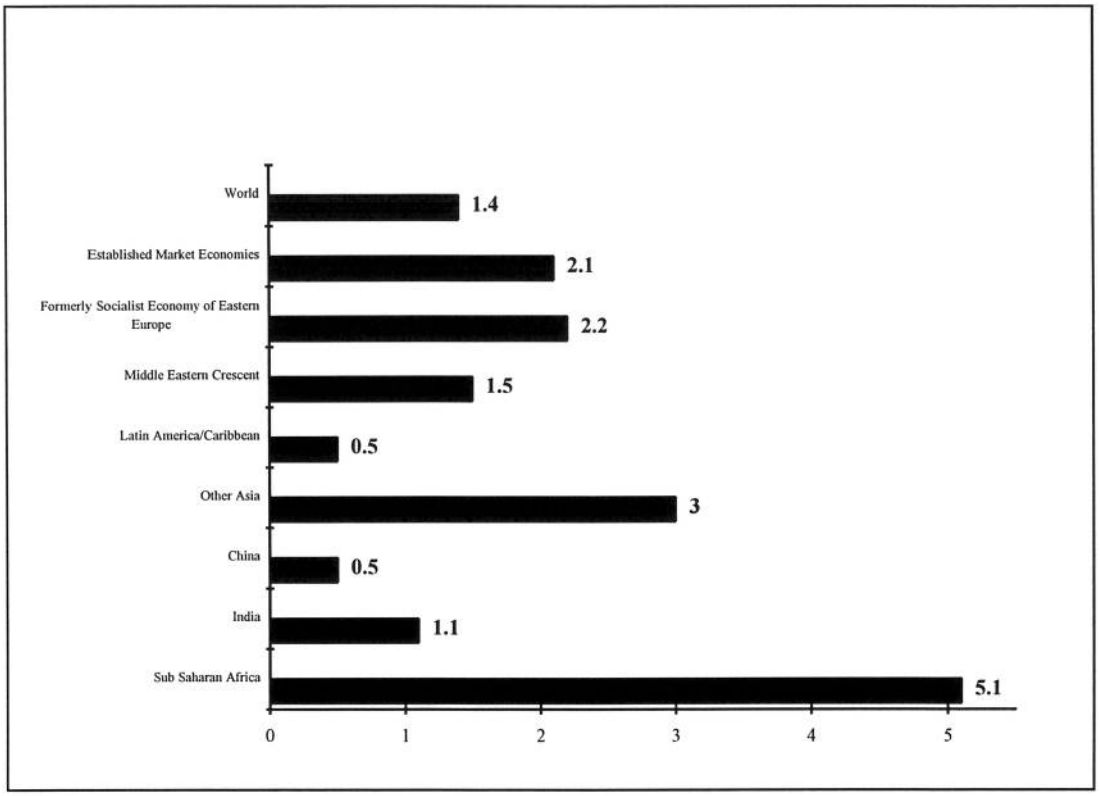
Chapter 5 provides an overview.

2. ACHIEVING THE "RIGHT" PROFILE

This chapter highlights the reasons why achieving the "right" personnel profile is important, and outlines some of the main approaches to determining personnel mix. Determining and achieving the 'right' mix of personnel is a major challenge for most healthcare provider units, be they community clinics, hospitals, health systems or community based teams. Healthcare is labour intensive, and in many units labour costs will account for two thirds, or three quarters or more of total running costs. With the cost of labour accounting for such a high proportion of total costs, it is important that managers and professionals in any healthcare provider unit strive to identify the most effective mix of staff achievable within available unit resources and priorities.

Most health systems around the world are coming under increasing cost containment and quality improvement scrutiny, often as a direct or indirect result of health sector reform; in such a situation the level and mix of staff deployed to deliver health care is a central element in the **cost** of care, and a major determinant of the **quality** of that care (see eg World Bank, 1994). Different countries and different health systems report different mixes and levels of staffing. It is important to note that whilst there may be general trends in the changing utilisation of health personnel, there is no common "starting point"; this limits the potential for transferability of results of studies, and highlights the need for more cross comparison (see Fig 2.1).

Figure 2.1 Nurse:Doctor Ratio, World Regions, 1988-1992



Source: World Bank, 1994

In more detailed terms, the reasons why achieving the right personnel mix continues to be a challenge can encompass one or more of the following:

- in guiding an organisational response to skills shortages in particular health professions or occupations

- in improving the management of organisational costs, specifically unit labour costs (ie to reduce costs per unit of "output", or improve "productivity")

- to sustain quality improvements (or maintenance) whilst reducing unit costs

- as an organisational response to technological innovation

- as an organisational response to sector reform or changes in professional regulation/legislation

- to assist in the development of explicit care standards or skills/competency based training of staff (subsequently these may be developed as criteria for performance assessment).

The main focus of this paper is on the first three of these reasons, namely changes in personnel mix that result from staff shortages, (a **supply side** factor); cost reduction interventions (often linked to the health sector reform and/or changes in funding mechanisms); and quality improvement initiatives (often linked to the development of consumer awareness in healthcare and/or the intervention of health "purchasing" organisations). These driving forces for focusing on personnel mix are not mutually exclusive; in practice, many healthcare units are attempting to meet the combined challenges of all three.

It must be stressed at the outset that examining and perhaps altering personnel mix is not the only potential solution to these challenges. Employing organisations will also have to review other options, including improving utilisation of hospital beds, capital equipment and other resources; improving staffing patterns in relation to day-to-day fluctuations in workload and patient dependency; and reviewing and altering resource allocation and distribution (eg between tertiary, secondary and primary care). It is apparent, however, from the literature reviewed in the next section, that many units have reviewed personnel mix (particularly within nursing, and between doctors and nurses) in attempting to meet the challenges of skills shortages, cost containment/reduction and quality maintenance/improvement.

Personnel mix reviews take two forms. One approach reviews an existing personnel mix (eg the use of an all-registered nursing workforce) and evaluates it in terms of either the quality of care, influence on patient outcomes, or costs, or ideally all of these factors. Alternatively, the research may focus on determining the "ideal" mix. Thus, rather than describe the pros and cons of an existing mix of staff, a number of papers look at the methods used to determine or ascertain the numbers and mix of staff that should be deployed in a specific environment.

In practice, a number of common approaches to reviewing and determining personnel mix can be identified; the application of these approaches in the health sector will be discussed in subsequent sections of this paper, but a brief overview serves to highlight the main strengths and weaknesses of each method.

Approaches to reviewing and determining personnel mix can be categorised as adopting a mainly **quantitative** or **qualitative** approach. Some of the main methods are listed in Table 2.1 and are discussed below:

Table 2.1 Main Approaches to Determining Skill Mix

Approach	Methods	Strengths/Weaknesses
Task Analysis	Frequency and cost of 'task' elements of jobs identified. Skills and knowledge required for 'tasks' agreed; use to profile staff and identify gaps	Reliance on trained observers (costly; problematic if no agreement of skills/knowledge required). Task based approach criticised because it focuses on the "measurable"
Activity Analysis	Activity performed by each staff member recorded by observers at predetermined intervals, for agreed time period. Frequencies of different activities/time required identified. Data analysed, used as basis for reallocation of activities/tasks to staff	Quantitative approach can be used as basis for discussion and debate. Observers can be expensive; difficult approach if workplace is not a 'fixed' ward or unit; danger that if staff are not involved they will not accept results
"Daily Diary"/Self Recording	As above, but staff record activities	Can limit cost implications of using observers (but opportunity cost). Staff may not provide accurate details. Strength is direct involvement of staff
Case Mix/Patient Dependency	Patients/clients classified in groupings according to diagnosis or dependency. Formula used to relate "scores" to staff hours required	Uses mix of qualitative and quantitative methods. Benefits can include determining variations in staffing over time to match changing workload. Primarily gives only overall numbers of staff; further work required to determine mix
Zero Base Reprofiling	Detailed analysis of current mix, activity, skills and costs. Working group considers alternatives within available resources; aim is to achieve 'ideal' mix	Radical and fundamental. Rarely applied in full, because of organisational/political constraints. Danger of becoming a "wish list", with less focus on "how to get there"
Professional Judgement	Staff/management in work area assess current activity and staffing, review data available, apply collective judgement to reallocation of work	"Low tech" approach; involves staff, can be quick. Constraints are that can be lack of transparency/objectivity; possibility of little change
Job Analysis Interviews	Detailed individual or group interviews; can include critical incident technique; repertory grid	Structured approach, if interviewers are skilled can reveal much relevant information. Involves staff. Main problems are potential for bias and lack of objectivity
Group Discussion/"Brainstorming"	Facilitates workshop/discussion group of staff to identify issues requiring change. Use of available data as basis of discussion	Can be quick - often used as 'diagnostic' phase of approach. Involves staff. Requires skilled facilitation; raises expectations and can generate mass of contradictory information

A. Quantitative methods for determining personnel mix

1 Task Analysis

(i) Jobs within the area under review are broken down into individual tasks - and each task is assessed in terms of by whom, when, how often (frequency) and for how long they are undertaken.

(ii) A staff cost per minute of each grade/occupation of staff time is derived from wage costs.

(iii) A cost per task is derived, using the appropriate staff cost, task time and frequency.

(iv) Using the data and analysis for (i) to (iii) a working group of relevant staff and management define the skills and knowledge required for the service and for each defined task.

(v) The working group also agree the correct staff "profile", in terms of current skills and knowledge possessed by each grade/occupation.

(vi) The working group then identifies "gaps" and mismatches between the current allocation of tasks to skills/knowledge.

(vii) In turn, this allows identification of the 'ideal' task allocation - that which would maximise efficiency and effectiveness by ensuring that tasks are allocated to the "least expensive" appropriately skilled staff - and also the identification of training needs for staff.

This method is usually most appropriate where activities and tasks are easily definable and "measurable". Reliance on trained observers contributes

significantly to the cost of this approach, which can also be problematic where there is no agreement, or differing interpretations or skills/knowledge required for specific tasks. The task based approach has also been criticised by some commentators because in disaggregating jobs and roles into "measurable" tasks, it may fail to capture much of what "holistic" caring roles encompass.

2 Activity Analysis/Activity Sampling

(i) The activity being performed by each staff grade/occupation at predetermined specific intervals (eg every five minutes, or fifteen minutes). Activity is recorded by trained observers on a form, template or hand-held computer, using a pre-agreed comprehensive list of possible activities.

(ii) This activity data is collected for all involved staff for an agreed time period - usually between one week and one month (care must be taken to control for the representativeness of the particular time period).

(iii) The data is normally inputted and analysed on computer, enabling the frequencies of different activities and time required for each to be assessed, and the mix of staff/grade occupation undertaking each activity to be profiled.

(iv) Analysis of the activity data and staffing profile enables decisions on reallocation of activities to different staff grades/occupations to be undertaken from an informed standpoint.

The main benefit of this approach is that the quantitative data can be used to inform judgements and allows discussion and debate using commonly agreed

"measures". The limitations relate to the use of observers (who are comparatively "expensive", and may not fully understand or record what they are observing); the difficulties of using this approach in any work environment other than a "fixed" ward or unit (ie it is difficult to use in community/primary health settings); and the danger that a lack of staff involvement in the approach may limit its acceptability.

3 "Daily Diary"/Self Recording of Activities

(i) This approach uses the same methods as activity analysis, by recording activity over an agreed time period on a predetermined checklist. It differs in that the staff members themselves undertake the recording and complete the forms, rather than external observers.

The approach may limit the problems of cost and comprehension created by using external observers and give staff "ownership" of the data and the method. However the main limitations are that individual staff may not provide accurate details (this can be mitigated by "quality assurance" sampling and by using a pilot exercise) and the opportunity cost of time spent by staff during the exercise.

4 Case Mix/Patient Dependency

(i) This approach relies on the assumption that certain types of patients, for example those with the same diagnosis, will have similar needs, and therefore the care of patients in the same grouping, will require similar levels and types of care. Thus a patient classification system is used as an indicator of staffing requirements. The focus is generally on numbers of nursing staff.

(ii) Two main ways of classifying patients. One is to use a medical diagnosis as the basis of classification. In the USA, Diagnostic Related Groups (DRGs) are used and their equivalent in the UK is Health Resource Groups (HRGs). Benefits of using the clinical diagnosis are that medical diagnoses are common currency with health care staff, they are relatively clear cut, and can be extracted from existing records or case notes without having to make a new assessment of the patient. A disadvantage is that the care requirements of patients in the same DRG can vary widely.

The alternative approach is to group patients according to their level of dependency on eg nursing care. Typically, patients are classified on a numerical scale (eg 1 to 5) by either the nurse in charge or by the nurses with most contact with each patient. The patient classification relates directly to the staffing input that is likely to be required. At the heart of this system is a formula relating patient scores to minutes of eg nursing care required. The accuracy and usefulness of a patient dependency scoring system depends on the how the link between patient scores and the staff required is made. Ideally, the equation relating patient scores to the nursing staff required should be based on locally derived activity data. The less locally specific the timings, the greater the scope for inaccuracy.

iii) Patient dependency scoring systems use a combination of qualitative and quantitative techniques. The classification of patients into groups relies on a professional judgement, but translating the scores into staffing figures requires data derived from activity analysis.

iv) Most of the systems that rely on patient classification are used to determine overall numbers of nursing staff rather than the specific *mix.* Some use nurses' opinions of the roles to calculate the proportion of each grade of staff required.

v) Patient classification systems are particularly useful for determining how the staffing profile may need to be changed over time — either to identify peaks and troughs of staffing needs over the course of a typical week or seasonal changes in case mix and dependency of patients. PCSs can be used to adjust staffing accordingly.

5 "Zero-based" reprofiling

(i) As a starting point, a detailed analysis of current staffing mix, activity, skills and costs is undertaken, for consideration by a working group.

(ii) The working group also reaches agreement on the purposes and strategic plan for the particular unit.

(iii) A "zero base" alternative to personnel mix is then considered. This approach assumes a 'blank sheet of paper', it requires construction by the working group of what they regard as the "ideal" personnel mix to provide the agreed activities and skills required to meet the purposes of the unit, within the identified costs.

(iv) This 'ideal' should be subjected to comprehensive testing of assumptions, using an iterative approach. In essence, it is attempting to answer the question "Setting aside correct staffing configuration and

constraints, what would be the ideal mix of staff to meet agreed service purposes and strategic plan?"

This radical approach to reviewing personnel mix represents a fundamental restructuring of an organisation, and in practice is rarely attempted, because of organisational constraints and considerations. A variation on the zero budget approach to the justification of resource allocation, the main strength of the approach is its requirement to think "alternatively" and to address the fundamental question of "what are the purposes and strategic objectives of the organisation". The major limitation of the approach is that, even if it secures the support of staff, it can become a 'wish list', an ideal of "where we want to be", rather than a method of "how we get there".

B. Qualitative methods for determining personnel mix

1 Professional Judgement

(i) Staff/managers familiar with the work area to be reviewed form a working group to discuss/assess work.

(ii) The group reviews available information on activities/skills, and uses the professional judgement and knowledge of the work area to agree any reallocation or reconfiguration of work which will improve effectiveness.

This approach can be comparatively quick to undertake, has the benefit of involving staff from the beginning and has limited resource implications. However the major constraints of the approach is that if used in isolation, it can have a lack of transparency and objectivity; and there is also a likelihood that any outcome, in terms of proposed changes, may be marginal.

2 Job Analysis Interviews

(i) The use of detailed interviews with individual job holders or small groups of staff can be undertaken to assess skills and activities.

(ii) Job analysis is usually undertaken using a structured interview approach, to elicit details of job content and how different tasks and activities fit together. The approach can incorporate elements of the "critical incident technique" (Flanagan, 1954), which attempts to differentiate between tasks and activities which are central to excellent performance in a job, and those that are not, by requiring the job holder to describe several examples of 'excellent' and 'poor' performance in their job. Another technique which can be applied is that of "repertory grid" (see Stewart and Stewart, 1981), which requires job holders to compare activities and tasks, in terms of their components, the skills required to perform them well, and the cognitive processes which underpin them. Repertory grid can also be used by job holders to rank, in order of difficulty and frequency, different tasks and required skills.

(iii) Interviews of individual job holders and managers is likely to comprise one element of any approach to determining personnel mix: they may be used to supplement data derived from the quantitative approaches, but alternatively may comprise the main source of descriptive

information or activities and skills required on which to make decisions.

The main benefit of using job analysis interviews is that a structured approach, conducted by skilled interviewers, can generate much relevant information on job contact and skills. Staff are also involved in the process from the outset. The limitations of the approach, if used in isolation, are its restricted objectivity and potential for interviewer bias.

3 Group Discussion/"Brainstorming" Session

(i) A facilitated workshop of staff is organised, to cover topics of activity lists, job roles and overlap, job dissatisfaction, organisational "blockages" on staff performance, scope for "doing things differently" etc.

(ii) The results of the workshop, in terms of lists of activities, opinions on current problems and suggestions for change, can assist in determining the scope for altering practice in relation to staff mix and deployment.

This approach is comparatively quick, requires skilled facilitation, and can lead to an 'honest' debate about working practices, but is likely to generate a mass of opinions (some contradictory), many of which will be unsettling and will create expectations of positive change amongst staff. As such, it may be

conducted as the initial "diagnostic" phase of a review, rather than acting as the main source of data and information.

C. Evaluating cost-effectiveness

Regardless of the approach used to determine the mix of staff, or whether it is an existing configuration of personnel that is under scrutiny, managers need to know the cost-effectiveness of a given mix. Methods used to evaluate both the effectiveness of care provided and its costs, are described below:

1 Effectiveness of Care

(i) Patient Outcomes

In an ideal study, the effectiveness of a particular combination of health workers would be defined by the effect they have on patients' outcomes. The outcomes produced by one mix could then be compared with those produced using another, and a judgement made about which is the more effective. There are several reasons why this ideal approach virtually never happens in reality.

a) It is difficult to identify suitable indicators of patient outcome. General indicators such as mortality rates or length of stay, are useful in that they can be applied to all patients, and can be considered to be an end result of care. However, their crudeness as an indicator of outcome means they are not sufficiently sensitive to pick up changes

related specifically to staffing mix. The problem with using more specific indicators — such as the incidence of pressure sores, or level of pain management — is that they are only applicable to some patients and that they report on the effects of a few selected aspects of care whilst the rest remain untested.

One solution that has been developed (see for example Higgins et al. 1992; Bostrom and Zimmerman, 1993) is to attempt to use a battery of outcome measures in combination with each other.

b) Patient outcomes are affected by a wide range of factors aside from the care provided by a group of health care personnel. In many cases it would be helpful to be able to link specific outcomes to the input of specific staff groups — for example in reviewing the effectiveness of all registered nurse staffing, it would be useful to define those outcomes that can be considered 'nursing outcomes'. Teasing out the effects of one group of staff whilst controlling for the effects of others is an extremely challenging task that has not currently moved beyond the exploratory stage and requires detailed research.

c) Comparing the outcomes produced by one mix with those produced by another demands assiduous application of controls. To control adequately for the huge number of variables (related to patients, staff, interventions and the environment) that are likely to influence patient outcomes is extremely problematic.

(ii) Quality

Due to problems associated with using patient outcomes, quality of the care provided is often used as a proxy for outcomes. Although this has its limitations in that it is a process indicator, not a measure of output, it has the advantage that the quality of care provided by specific staff groups can be measured.

D. Costing Methods

The different methods used to assess the cost of health care represent different responses to the same problem — how can the total costs of providing care be disaggregated to produce a cost per unit? The systems used vary according to the 'unit' chosen. Many studies relate costs to diagnostic related groups (DRGs), or a patient classification system that indicates level of nursing dependency. Some measure of time is included — for example costs per patient day, or per minute of care provided. Alternatively costs may be based on completed patient 'episodes'. Whichever unit is chosen, in an ideal situation the cost figures used should not be based solely on direct salary costs but should also include on-costs, shift enhancements etc., and should be based on actual costs, not a notional figure derived from assumed averages.

The cost data used in studies of personnel mix varies markedly, in terms of configuration and accuracy. This is partly a reflection of the differing financial requirements of different health systems - for example, in privatised systems there may be an organisational need for accurate staffing costs per patient day, and the costs of other inputs, to ensure reimbursement. In other systems, cost data may be more frequently expressed only in broad terms of wage costs.

Most studies which examine personnel mix rely on wage costs; it is important to stress that where "before and after", or comparative evaluations of costs are being undertaken, a reliance on wage costs as the cost indicator will make the evaluation highly sensitive to wage differentials between groups of personnel; these differentials can vary markedly between employing units, healthcare systems and countries and across time. If a wage differential between a doctor and a nurse is 5:1, the potential cost savings of substitution appear much greater than in a system where the wage differential is 2:1.

A number of reports and articles have focused primarily on establishing and testing a specified costing methodology, rather than reviewing and assessing the results of applying a costing method, within a particular mix of personnel. These studies also tend to give little or no attention to outcome (see Edwardson and Giovannetti (1987) and McCloskey et al (1987) for reviews).

Edwardson and Giovannetti (1987), and others, report that one common methodology for costing nursing services in the United States is based on a system of patient classification. Patients are categorised according to an assessment of their nursing care requirements over a specified period of time. Dijkers and Paradise (1986) compared the results of assessing nursing care requirements using a variety of different patient classification systems (PCSs), for two diagnostic related groups (DRGs), and found marked variations in outcome. Dijkers and Paradise note that many systems do not differentiate between different preferred or required levels of trained staff (eg RN, LPN or NA) and found variations in the estimation and allocation of indirect costs. They conclude that not all available PCSs "can appropriately estimate costs" (p34) and express particular concern that in areas of short staffing, costing using PCSs can lead to large margins of error.

Many other studies conducted in the United States in the mid and late 1980s concentrate on the use of patient classification systems (usually in relation to DRGs) as a means of assessing the cost of nursing care, for charging and reimbursement purposes. These studies focus on establishing a cost methodology, usually within a specific work environment. Quality of outcome is given little or no consideration, the prime concern being the need to more accurately measure and cost the use of nursing resources.

A series of other studies assesses the relationship between 'actual' nursing care costs (as defined by the authors) and DRG norms. Grohar et al (1986); Thomas and Vaughan (1986); Fosbinder (1986); Payson, (1987); Barhyte and Glandon (1988); Rosenbaum et al (1988); Wilson et al (1988) all attempt, in greater or lesser detail, to assess the links between patient acuity, DRGs and nursing costs.

Results from these studies are not readily synthesised into any general conclusions or lessons, other than that actual nursing needs per patient within and between DRGs vary markedly, and hence there is a considerable range in nursing costs within and among DRG categories. In short, different patients within DRGs have different acuity levels, different lengths of stay, and therefore different levels of demand for nursing resources.

Most of the studies reported above concentrate on small samples of patients in one or two units, and hence the effect of any "outlier" patients whose demands are above or below the DRG norm may be magnified. Indeed, a number of the authors caution against drawing any general conclusions from their work, which they regard as exploratory.

McCormick (1986) provides a table of the "Top 20" most expensive DRGs in terms of variable nursing labour costs per case and reports research which, it is claimed, demonstrated that nursing was a "bargain", accounting for a lower proportion of total reimbursement costs than previously considered. However, the same research failed to corroborate that an all RN staff (or staff with a high percentage of RNs) was more cost effective than that with higher proportions of LPNs or NAs.

A second broad group of studies can be identified, in which an attempt is made to consider the relationship between cost and quality. Many of these studies are informed by the work of Donabedian (eg 1984). The difficulties of linking an assessment of cost (often driven by a need to inform reimbursement charges) with quality and/or outcome of care is fraught with difficulty. A broad indicator of quality, such as patient length of stay (LOS) or a patient satisfaction survey is often used as a proxy measure for outcome. The use of such proxies can in themselves create difficulties.

Variations in length of stay may not be an accurate reflection of the care provided, but may be linked to broader organisational requirements to decant patients more quickly to free up bed space.

Patient satisfaction surveys are not necessarily a good measure of outcome (Kitson, (1986) notes the difficulty of defining the difference, if any, between patients "getting better" and "feeling better") and one recent assessment of the use of patient surveys as an indicator of nursing care quality cautioned that they "should not be used as the sole evaluation mechanism regarding quality of nursing care" (Eriksen, 1987; see also Nelson and Niederberger, 1990).

Flood and Diers (1988) examine the effect of varying nurse staffing levels on patient outcome and costs. Their perspective is based on concern about the outcome implications of understaffing. Flood and Diers examined the effect that staffing levels had on patient complications, acuity levels, length of stay, and cost; the data they used were controlled for DRG in order to make allowances for different dependency levels and treatments. Two medical units in a hospital were researched; one was experiencing short staffing, but both were budgeted for the same staff mix. The study therefore relies on comparatively small data sets.

The authors claim that their study reveals that "Nursing staffing levels make a difference in patient outcome in areas that can be translated directly into benefits to the hospital ... By reducing complications, acuity levels and LOS through adequate care, nurses potentially can save hospitals a great deal of money" (p 43). They also note "when units cannot maintain an adequate level

of nursing staff, patients also suffer from lack of care and hospitals suffer financially from increased LOS" (p43).

Omachonu and Nanda (1989) discuss the appropriateness of 'output' and 'outcome' when estimating nursing productivity and attempt to define in detail what 'productivity' is in the nursing context. They provide a conceptual framework for estimating input and outcome and measuring outcome based productivity, but no examples are provided of the application of the framework to the work environment. The authors note the comparative difficulty of measuring outcome, as opposed to output (based on DRGs and revenue generated) but stress that output cannot be used as a proxy for outcome, which includes an assessment of quality of care provided, and the effect of that care.

Cost containment pressures are cited as a major factor in the search for improvements in nursing productivity. Herzog (1985) notes that the substitution of less costly LPNs for RNs may not be cost effective because the LPN has a "smaller inventory of functioning skills and trained independent judgement" (p33). Edwardson (1985) summarises the "productivity" dilemma: "As the largest hospital division, nursing is a principal target for cost reduction ... As a professional group nurses have an ethical obligation to use resources wisely. As patient advocates nurses have a responsibility to protect patients from ill-conceived cost cutting measures" (p14). The author

concludes that carefully constructed and meaningful measures of nursing productivity are essential tools for fulfilling the "obligations" which the nursing profession has to patients.

Armstrong et al (1991) examine the methodological issues related to assessing costs of nursing care in the critical care setting and provide a specific example of applying a costing methodology to a hospital setting. They report that whilst critical care is an expensive service, critical care nursing is not the major component of cost. They also caution against cross comparison of costing studies because of methodological and organisational differences.

E. Summary

The approaches outlined above represent some of the main reasons for, and methods used by healthcare organisations to review the mix and level of personnel. Each approach has pros and cons, and often more than one method will be used in combination, to attempt to combat limitations. It must also be emphasised that a distinction must be drawn between the pragmatic approach necessarily adopted by many organisations, due to resource limitations and time constraints, and the 'purist' approach which would be dictated by an 'objective' research study, which requires a certain distance from day to day organisational priorities.

In practice, many of the studies reviewed in the next chapter relate to an organisationally based description of an approach to determining personnel mix, rather than a research based evaluation of an approach or of a particular mix. This pragmatism is highlighted by the stated need in many of these studies for broader contextual matters of "change management" to be a priority for the organisation - the method of reviewing and determining personnel mix is a means to the end of achieving organisational changes, it is not a conceptual model to be continually refined in the abstract.

In short, reported organisational approaches to determining personnel mix will often use one or more of the methods outlined above, but in a context where achieving change is the main priority, and not ensuring research "objectivity" or methodological rigour. The limitations which this imposes on the transferability of results and the generalisibility of conclusions will be a major theme of the review which comprises the next section of this paper.

3. REVIEWING THE LITERATURE

3.1 Introduction

This chapter discusses the main lessons which can be learnt from an overview of published literature on personnel mix within healthcare.

3.2 'Ideal' Criteria for Personnel Mix Studies

The previous chapter described the range of methods that can be deployed in studies about personnel mix and concluded that in many cases, the combination of methods used and overall study design is likely to be determined by a host of pragmatic considerations rather than principles of rigorous research.

This section considers the features of an 'ideal' study on personnel mix, before moving on to describe the extent to which the studies reviewed in the literature meet these criteria (see Table 3.1).

Table 3.1 Criteria for an "ideal" study of personnel mix

-	Relevant contextual information
-	Staffing profile detailed (includes numbers, grades, qualifications, etc.)
-	Workload data available (includes dependency/complexity)
-	Quality assurance/outcome measures valid and reliable
-	Comprehensive costing data
-	Overall approach methodologically robust, reliable, replicable

Features of an ideal study:

(i) it would provide contextual information on the work location and environment.

(ii) it would present a detailed picture of the staffing profile in the unit under examination (including information on grade, length of service, relevant qualifications etc. and "before and after" profile, where change was being evaluated).

(iii) it would incorporate measures of workload and activity accounting for variations in demand/complexity eg patient dependency scores.

(iv) it would use one or more statistically reliable and valid measures of care/ health outcome; appropriate to the work environment and client population.

In practice, many studies use measures of the process such as patient/client satisfaction or staff satisfaction to assess the quality of care as a proxy for true measures of outcome. Over-reliance on reported staff satisfaction may compromise the objectivity of a study.

(v) it would use relevant, accurate and complete measures of "cost", in order to enable appropriate comparisons of "before and after" or alternative models of personnel mix (see discussion in previous chapter).

(vi) The overall approach should be robust and methodologically sound; where sampling techniques are used, sample populations should be large enough to enable statistical analysis.

To help evaluate the design of research studies, Woolf et al (1993) described a hierarchy of evidence, as follows:

I Well designed randomised controlled trials

II-1 Other types of trial:
- well designed controlled trial without randomisation
- quasi experiments

II-2 Well designed cohort (prospective) study, preferably from more than one centre

II-3 Well designed case control (retrospective) study, preferably from several centres

III Large differences from comparisons between times and/or places with or without intervention

IV Opinions of respected authorities based on clinical experience; descriptive studies and reports of expert committees.

3.3 Features of Reviewed Studies

Few published studies conform to all of the above criteria, and the majority of study designs fall into the lower categories in the hierarchy of evidence described by Woolf et al (1993) (see IV - opinions/descriptive studies). The problem of obtaining a representative group of patients and staff is compounded by the fact that many of the studies are based on groups who have volunteered to be studied. The results from self selected samples may be biased and may not be generalisable.

Perhaps because of the complexity of determining and evaluating personnel mix and the wide range of methods that can be used (as described in Chapter 2), many of the papers focus on a particular aspect of reviewing personnel mix (eg describing the development of a dependency scoring tool or activity analysis methodology, or focusing on quality assurance) — rather than describing all the elements of a complete personnel mix review. In particular, specific measures of patient outcome (rather than proxy measures of process) are rarely used.

Even in the few studies that include a comprehensive assessment of costs, the exact method of calculation used in the study is often not reported. Different methods of remuneration and calculation of wages (ie are training costs to be allocated?; are unsocial hours premiums paid for certain times/days for certain groups?; are "on costs", such as employers pension contribution included?; are wage costs 'standard' for each grade/occupation or do they vary between individuals?) are major constraints on cross comparison of study results or generalisability of study conclusions, and are often a major weakness in individual study design.

Many studies fail to cover **both** measures of quality/outcome and costs, and many are methodologically weak with small sample sizes. Combined with the multiplicity of methods used to assess quality/outcome and cost (where these measures **are** used), the overall effect is that there is extremely limited scope to synthesise an aggregate overview of the results of these studies.

Even a focus on studies in a single country or health system, which can limit the difficulties inherent in cultural, organisational and country cross comparison, does not solve the problem of non-comparability of methods, and hence non-comparability of results.

In short, with a few notable exceptions, it is not possible to make general statements about the desirability or effectiveness of particular mixes of healthcare personnel. What is revealed by the review of the published literature is the non-comparability of approaches adopted for studies. This highlights the need to move towards the replicated use of reliable and valid research methods for assessing the effectiveness of personnel mix which have scope for utility and general applicability. The identification and replicated use of the methods which have greatest potential for transferability will lead to results which have greatest scope for generalisibility.

With this fundamental caveat in mind, what lessons can be learnt from reviewing currently available published studies? The following section reports on the key findings of the review.

3.4 Reviewing Literature on Personnel Mix

This section reports on a review of publications which examined personnel mix in healthcare; specifically, as requested, it concentrates on personnel mix **within** nursing and/or midwifery, and personnel mix **between** the nursing and medical professions.

3.4.1 The literature search

The review focused on English language publications that have been published in the last ten years (ie 1986-1996).

In the first instance, computer databases (CINAHL, Medline, RCN Nurse ROM, ASSIA Plus, FirstSearch) were searched using a selection of search terms as described below. The researchers also made use of the 'Internet' to request relevant material. Using the Internet gave us the potential to identify less well known publications.

All potential review items were entered onto a reference database. The researchers then attempted to obtain all items, within the timescale available to them. These

publications that were then obtained were scrutinised by the research team. The literature search was an iterative process, in that once a publication had been acquired, any references to other work were then followed up.

Computerised databases now play an essential role in conducting a literature search but the results of a literature search are limited to the range of journals covered by the database. Secondly, the outputs depend very heavily on the choice of search terms, and these vary considerably between different countries and cultures. The search terms used were: **skill mix; skill substitution; personnel mix; reprofiling; staffing levels; staffing mix**. A total of 473 publications were identified; these are listed in Appendix 2. From the initial total, a sample of 79 were selected for detailed examination (see Appendix 1).

3.4.2 **Mixes covered in the literature**

(i) Qualified/Unqualified Mix in Nursing

The literature on the effect of different mixes of qualified nurses (usually registered nurses) and unqualified nursing aides, assistants and/or support workers is comparatively extensive, but is primarily based on single study descriptive papers. The two most common themes which have been examined in this field are the effectiveness of an all qualified ("all-RN") nursing workforce, in comparison to a qualified/unqualified mix, and the impact on organisational costs and effectiveness of increasing the proportion of care

assistants/support workers in the nursing workforce. The former theme has been mainly examined in North America, particularly in the 1980s. A third theme which is underexplored is the implications for cost and quality of care of the use of relatives, other "volunteers" and traditional practitioners (eg traditional birth attendants) as part of the care team (see eg Hoff, 1995).

The theme of qualified/unqualified mix in nursing, linked to cost containment led substitution of "cheaper" care assistants for more "expensive" nurses, has become increasingly apparent in recent years in many countries. However, there are comparatively few published research studies examining the cost/quality implications of this trend, and (setting aside methodological and comparability issues) there is no unanimity in results or conclusions. Most of these studies tend to be unit level "before and after" examinations of the effects of introducing or increasing the use of care assistants. Most published work stems from the USA, and there are examples of studies which report cost and quality improvements in the "after" phase, whilst other studies suggest that the scope for real cost savings may be more apparent than real.

Drawing from the work reported by Gardner (1991) and Krapohl and Lawson (1996), a number of models of qualified/unqualified mix in nursing can be identified:-

1) "Traditional" aides/assistants/auxiliaries, mainly trained "on the job", performing simple nursing tasks in support of registered nurses

2) Non-clinical assistant/"extender" clerk/aides role, mainly involved in non clinical clerical/housekeeping work (can be a "multi-skilled" support worker)

3) Technician technical assistant/operating department assistant role with specified remit in relation to use of complex technological processes, assisting nurses

4) Primary practice partner nursing assistant "paired" with primary nurse to maintain delivery of care by primary nursing

5) Vocationally trained/qualified carer an additionally trained version of the "traditional" nurses aide. Training programme of several weeks; in some countries leading to vocational qualification. Carer undertakes nursing care responsibilities under direction of registered nurse

The fundamental issue in determining which model is in use is to identify if the aide/support worker/"extender" is being used to supplement, complement or replace the work of a qualified nurse.

Recent studies which have evaluated the introduction of some form of "extender" and which report mainly positive results include Hesterly and Robinson (1990) (Use of Patient Care Assistants, claimed costs savings); and Bostrom and Zimmerman (1993) (Use of nurses' aides, claimed cost savings, no change in patient satisfaction). Other studies have been more equivocal in their conclusions, and have highlighted problem areas (eg Powers et al

(1990)), use of "co-workers", found slightly increased productivity, but decreased quality and increased on call, sick leave and overtime working); Garfink et al (1991) (use of patient care technician - cost savings, but RNs reported higher workload, and initially higher turnover of PCTs).

Whilst the issue of qualified/unqualified mix has received a comparatively high level of local attention, the major limitations of the utility of these studies is that many are methodologically weak; they often report on short timescale implementation, and tend to be written by the "champions" of the use of the nurse "extenders". As with other areas of nursing and medical research publication, there is also a publication bias towards publishing studies with clear and positive findings.

The work of Carr-Hill et al (1995) in Britain provides one of the more detailed studies in this area. The conclusions of the study - that investing in additional training, and the use of "richer" (and more expensive) staff mix in nursing, can have a payback in quality of care improvements - is one of the more robust pieces of work which supports the "cheapest mix isn't necessarily best mix" argument.

(ii) Qualified Mix within Nursing

Fewer published studies examine the effects of variations in skill mix within nursing qualified grades or specialties. In practice, most of the few publications identified which attempt to assess costs and quality implications focus on **grade,** qualification or job title rather than skill, and examine the effects of different mixes of first level qualified nurses (ie registered nurses) and second level qualified nurses (ie enrolled nurses/licensed practical nurses). Some of these studies have been conducted in the context of the "phasing out" of second level training; in other instances the motivation is similar to that of the qualified/unqualified model - that of cost containment by maximising the use of "cheaper" second level nurses.

The Australian study of nurse mix by Pratt et al (1993) reinforces one of the major caveats already discussed - that context and local circumstances will vary, and limit the potential for any generalisation of "ideal" mixes. This study compared the registered/enrolled nurse mix in relation to cost and outcome, in two ward configurations - one all-RN, one a RN/EN mix. The researchers found that an all-RN mix was more cost effective in one study ward, whilst the RN/EN mix was more cost effective in the other study ward. This study, although tentative in nature, demonstrates that the application of a standard battery of research instruments to two different work environments can provide results which suggest that different mixes may be more

appropriate in different environments (or, alternatively, to suggest that no battery of research instruments can be so robust and comprehensive as to include the effect of all local demographic and contextual variables).

(iii) Doctor-Nurse Overlap/Substitution

Issues relating to the scope for extending the role of the nurse and developing clinical nurse specialists, nurse practitioners, clinical nurse midwives and nurse anaesthetists are the most robustly researched area of personnel mix in healthcare.

Skill substitution and the development of alternative models of care delivery based on nursing/midwifery staff rather than doctors has been examined in a number of studies which have adopted a robust and methodologically sound approach. This is the only area where there has been some use of randomised control trials, to assess quality/outcome, and is also the only area where there has been any real attempt at meta-analysis of research studies.

The main sources of meta-analysis are from North America:- eg Feldman et al (1987) and Brown and Grimes (1995). A review has also been undertaken recently in Britain (Maynard et al, 1995). The use of nurse anaesthetists world wide has also been examined (McAuliffe and Henry, 1995).

The use of meta-analysis and the comparatively robust research approach adopted in a number of studies in this area, supports a more conclusive overview than can be drawn from other areas of personnel mix evaluation. The general picture presented is that in certain specified areas of health delivery and clinical intervention, there is clear evidence, from several studies (mainly, but not exclusively from the USA) that there is scope for increasing the role and deployment of clinical nurse specialists, nurse practitioners and clinical nurse midwives, whilst maintaining or reducing costs, and monitoring or improving care outcomes. However, the **extent** of scope for substitution or development of alternative models of care delivery cannot be detailed or quantified, as the available research does not fully map out the parameters of role overlap/substitution, and many possible alternative models remain untested. Furthermore, the "starting point", in terms of the current roles and models vary from country to country, and the identification of 'theoretical' or 'ideal' personnel mix between doctors and nurses, as between any professions or occupations, also has to take account of potential constraints on change relating to legislation, professional regulation and associated organisational factors.

3.5 **Conclusion**

In the previous section, it was noted that there are extreme limitations to deriving general conclusions and lessons from the available published literature in this area. There are two main reasons for this. Firstly, many

published 'studies' are, in practice, descriptive accounts, which add little to the body of knowledge in terms of use of methods or interpretation of results. Secondly, where studies do move beyond description, their utility is often constrained by methodological weaknesses, or the lack of appropriate evaluations of quality/outcome **and** cost, or the use of small sample sizes (or all three).

The end result is that the results of some evaluative studies may be suspect, and the results of many other studies are difficult to compare or generalise. Aside from the methodological weaknesses that prevent the results of the individual studies from being added together to produce general conclusions about the cost effectiveness of different mixes, there is a more fundamental reason why such general conclusions cannot be reached. The results from even the most rigorous of studies, incorporating all of the features of an 'ideal study' listed at the start of this section, cannot be applied to a different setting. The results of each study only remain true for the time and place from which they are derived. This is the basis on which personnel mix exercises are based — the need to identify the care needs of a specific patient population and match these to the skills of staff available. It is thus impossible to prescribe in detail the ideal mix of personnel.

The two mains areas where current research does make a significant contribution to issues of personnel mix are in relation to mix of staff within nursing and in doctor/nurse mix.

In nursing staff mix (often termed "skill mix", but rarely examining skills), the simplistic notion that increased use of less qualified ("cheaper") staff will in all cases be effective, is not supported by all studies (it is equally important to stress that in certain situations as measured by specific studies greater use of care assistants **does** lead to greater organisational effectiveness).

In relation to the doctor/nurse overlap, there is clear evidence from the available research that there is as yet unrealised scope within the constraints of country and system specific regulations for extending the use of clinical nurse specialists, nurse practitioners and clinical nurse midwives, and for further developing nurse/midwife led forms of care delivery, such as midwife led maternity units. What remains comparatively under-explored in terms of published work is the associated issue of developing medical assistant roles.

The next chapter will move on from this overview of the literature to the discussion and outline design of a research instrument designed to improve the utility of current research and assist in the transferability of current research methods. Whilst it is not feasible to produce a single answer to the question of

'what is the most cost-effective mix of health care personnel?', it is possible to identify different approaches for addressing this question, in any one site.

4. Developing a Research Instrument for Personnel Mix

4.1 Introduction

Drawing on the lessons of the review, this chapter describes the development of a research instrument designed to improve the utility of current research and systemise the use of appropriate research methods in examining personnel mix.

4.2 Design Criteria

Some of the main factors which underpin this design are as follows:

(i) recognition that transferability of methods has to be a priority, prior to there being greater scope for generalising results.

(ii) recognition that many published studies make inadequate use of available methods for examining quality of care, and staffing costs.

(iii) recognition that many studies "reinvent the wheel", rather than drawing on previous work in the area.

(iv) recognition that many contextual issues (eg location, specialty, number of staff involved) contribute to the "uniqueness" of any published study or proposed application of a particular method. These have to be acknowledged and considered when examining results and drawing conclusions.

(v) recognition that utility and applicability should be design criteria. The instrument should assist managers and professionals in a broad range of

countries and health systems to determine which approach is appropriate to examining personnel mix.

(vi) the instrument should not be prescriptive, but should provide a framework to assist decision making and informed judgement. Indeed, by the very nature of the broad range of potential situations in which it should have relevance, and because of the need to retain utility and applicability, the instrument **cannot** be prescriptive or focus only on a particular approach.

4.3 The Research Instrument

The instrument which is described below is designed to meet the requirements set out above, and is intended to be developed for use in informing the judgement and decisions of managers and professionals as they examine issues of personnel mix.

The overall objectives of the research instrument are threefold:

(i) to assist managers and professionals to review approaches to personnel mix relevant to their own situation

(ii) to assist in moving towards improvements in evaluation methods when examining issues of personnel mix

(iii) to facilitate the development of a database of approaches to determining and evaluating personnel mix in healthcare, which can assist the transferability and replication of appropriate methods, and therefore, in the longer term, contribute to the knowledge base and generalisability of studies in this area.

To meet these objectives, the instrument which has been designed is a standard template for systematic review of individual approaches to personnel mix, which also acts as the framework for a database which can be used to identify relevant approaches and models. The individual 'cells' of the template highlight specific elements within approaches to evaluating personnel mix; the database can be interrogated to provide information on all known models which conform to a particular set of context specific characteristics. In short, a manager or professional wishing to examine alternative approaches to personnel mix in a particular context, or review the reported methods and outcomes used in previous relevant approaches, can access this information rapidly and systematically.

The template can be used in two ways. Firstly, for the purposes of the current project, it has been applied to the literature on healthcare personnel mix to facilitate a systematic review. The resultant reviews are stored in a database which can then be interrogated in two ways. The reviews can be sorted to identify studies on a specific topic. Alternatively all the reviews can be analysed together as a single entity, to produce a profile of the research to date. In this way, the general strengths or weaknesses of the current body of knowledge can be described, and gaps identified.

Secondly, the template offers a structured approach that can be applied to other material. It offers the user a way of thinking about personnel mix. This structured approach is illustrated as a conceptual model in Figure 4.1.

The model shows the hierarchy of information that can be used in determining a skill mix. The specificity and level of detail increases from top to bottom, thus requiring more elaborate types of data.

Ideally, it might be hoped that skill mix decisions would be based on information at each level - starting from an understanding of the client group served, the type of care provided and how this relates to the aim of the unit, and going through to identifying the competencies and skills required to perform each of the activities that constitute the service. In this 'ideal' scenario, to work out the skills required and the staff needed you have to work "backwards", beginning with a decision about what the activities are that make up the care for the particular group of patients.

In reality, staffing patterns are often determined on the basis of just one or two types of information. So several of the steps in the model may be omitted or jumped. For example, patient dependency scores may be used as an indicator of the level of nursing care required, or the case mix might be looked at to estimate the mix of staff needed. The higher up in the hierarchy you go, the more broad brush the data, and the greater the number of assumptions made about the link between the information and staff required. For example, staffing based on ratios eg community nursing staff for every head of population - do not take into account any variation in the proportion of the population with health care needs, the type of care required, the activities involved in providing care etc.

The purpose of the model is to illustrate the different components that may be included in a study of personnel mix. The cells (elements) of the template are set out below and shown in Figure 4.2:

A. Author(s)/Title/Source/Year/Volume/ Part/Pages

These standard cells are designed to facilitate access to published papers and articles. "Author" may refer to individuals or institutions. The cells could also be used to record key identifiers (title, author, year, source) for unpublished papers and documents.

B. Study Type

Four categories of study type have been identified in this instrument:

1. Single research study
2. Literature review
3. Meta-analysis
4. Descriptive report or paper (no, or little evaluation).

C. Model

This cell requires the reviewer to identify what aspects personnel mix are being studied. At first glance, the body of literature produced by the search can seem to consist of a collection of unrelated publications — it can be hard to see how they relate to the broad theme of personnel mix or how they relate to each other. The model described in the previous section (Fig. 4.1) is used to identify which elements of skill mix are being examined. The first distinction to make, is between those

studies that focus on the **methods for determining** mix, as opposed to those that **evaluate a mix.**

Each of the elements in the model is labelled with a letter to allow the specific combination of approaches included in any one study, to be coded. Thus the subject area of the studies can be compared, and the number addressing each aspect of personnel review can be analysed.

D. Country

The country in which the study was conducted (NOTE: not always the same as country of publication).

E. Location

For certain types of study, recording of geographical location can be a relevant identifier (eg in studies examining maldistibution-distribution of staff mix between rural and urban areas). In other "single site" studies, the location may not be a relevant factor.

1. Rural
2. City
3. Town
4. Mixed
5. Not available/not relevant

F. Specialty

This cell highlights the potential for specialty specific issues acting on personnel mix (eg certain "high tech" specialties such as intensive care often require a "rich" skill mix) and enables identification of relevant studies within a particular specialty.

1. Medical
2. Surgical
3. Theatre
4. Intensive Care/CCU
5. Care of Elderly
6. Community based care
7. Paediatric care
8. Midwifery
9. Mental Health/Psychiatric Care
10. Learning Difficulties/Mental Handicap Care
11. Outpatients
12. Accident and Emergency
13. Primary Care
14. All (non specific)
15. Oral Health
16. Prenatal Care

G. Setting

This cell highlights the potential impact of workplace setting on issues of personnel mix; it also facilitates identification of previous studies/reports focusing on a particular setting.

1. Acute hospital(s)
2. Non acute hospital(s)
3. Hospital - Outpatient
4. Nursing Home
5. Community Clinic/general practice surgery
6. Community care/care at home
7. All: non specific

H. Mix

This cell enables identification of the particular mix of personnel under scrutiny. The categories highlighted below differentiate the main area of skill overlap or staff mix which can be the focus of an approach to determining personnel mix. Whilst many approaches concentrate on specific areas of overlap or mix within a professional grouping or work area, other forms of reprofiling take a broader perspective, covering all staff groups.

1. Qualified Nurses/Midwives and Doctors
2. Qualified and Unqualified Nursing Staff (including care assistants)
3. Mix **within** qualified nursing workforce
4. Qualified and Unqualified Midwives (including care assistants)

5. Mix of Qualified Midwifery Staff
6. Qualified Nurses/Midwives and other Qualified Professionals
7. Mix of other Qualified Professionals
8. All groups/multiprofessional mix

I Aim

This cell briefly describes the stated aims/objectives of the particular study.

J Design

This cell enables details of the study design and methods to be recorded. Previous studies which have adopted a particular approach can be identified; this assists in networking of replicable approaches and enables managers and professionals to make decisions on relevant approaches from an informed standpoint.

K Size

This cell enables any relevant numerical indicators of the scope of the study to be recorded - for example, number of beds, number of clients/patients. One limitation on many published studies is that they focus on relatively small work areas or volumes of activity.

L Numbers of Staff

This cell is intended to act as a record of the staffing dimension of the study-approach. The intention is to delineate the numbers and mix of staff included in the scope of the study. (NOTE: In many publications details of overall numbers and mix of staff are not given; differentiating between numbers/mix "employed" and number/mix actually deployed at any one time is also often problematic. See "**Sample size**" below).

M Time Frame

The time frame for the study, where appropriate, should be known. Two factors of relevance are the **length** of the elapsed period of the study (is it days/weeks/months) and the **representativeness** of that time period (ie was it a "**typical**" time period, in terms of volume of activity, workload, patient dependency etc.).

N Outcome

This cell highlights the measures of "quality"/outcome used or reported in the specific approach. In many published studies outcome indicators are "proxy" measures such as reported staff satisfaction, but some research reports do focus in more detail on measures of patient outcome.

O Tool

This cell records the reported use of one or more validated survey instruments or research tools. These "tools" may be proprietary patient or staff satisfaction questionnaires, "off the shelf" packages for use in patient dependency scoring, quality assurance or monitoring of outcome, and computerised systems for use in determining workload and staffing levels.

Recording the tools used in a particular study enable cross reference with other studies which have used the same method; given that these different tools do not necessarily give the "same" answer, when applied in the same context, it can often be more appropriate to cross compare with the use of the same tool in different situations.

P Sample Size

It is important to ensure that the same size(s) used in any evaluation of an approach to personnel mix are large enough to support statistical analysis. Moreover, many published studies report on evaluations based on comparatively small samples of patients/clients and/or staff. Knowledge of the sample size enables proper consideration of the value of the stated results and conclusions. Studies which make claims for generalisable results on the basis of small samples of data should be treated with extreme caution.

Q Cost Measures

For comprehensive evaluation of personnel mix to be undertaken, information on costs must be considered. Ideally this should include measures of staffing costs per patient day/client episode; often, however, average or aggregate staffing costs will be used. This cell enables recording of the measure(s) of cost to be recorded. It should be noted that many published studies make no, or little attempt, to "cost out" personnel mix.

R Critique

This cell allows a brief record of the strengths and weaknesses of each report to be recorded. This summary provides an insight into the limitations of each approach, as applied in practice, and can assist managers and professionals in identifying the most relevant approach.

S Conclusion

The main conclusions of the study are highlighted in this cell. In reviewing previous studies it is important not to focus only on stated conclusions; as noted above (eg Outcome; Cost Measure; Sample Size) many studies have methodological inadequacies which call into question the complete accuracy of study conclusions. In many cases, study conclusions are qualified by

statements relating to the limitations placed upon generalisability, due to contextual or methodological factors.

However some studies which should have such qualifying statements report only "positive" or supportive conclusions, rather than providing a more comprehensive overview of the strengths and weaknesses of the reported approach to personnel mix.

Appendix 1 illustrates the use of the template, as it is applied to a selection of 79 publications.

4.4 Testing the Research Instrument

The template developed as the framework for this research design is capable of being completed on a single A4 page as a 'paper' record, but is also intended for use on a computerised database, to facilitate review, extraction of examples according to predetermined criteria (eg country, specialty, mix) and continual updating. It provides both an "aide-memoire" highlighting the main data elements that should be available in an 'ideal' approach to determining and evaluating personnel mix, and a structure for systematic and standardised recording of the elements of approaches which have already been reported.

In designing the template, a balance has to be struck between **utility** and **comprehensiveness**. The research design must conform to the requirements of the specification; in terms of utility it must be applicable across a range of countries, health systems, work locations, capable of being applied to different mixes of staff in different specialties, and of practical benefit to managers and professionals, in terms of providing a useful framework and access to standardised information and data. It must also be as comprehensive as is practical, covering the main elements required to review and record approaches to personnel mix in healthcare.

The template and framework are a tool for assisting in making informed decisions on personnel mix, thus do not provide a prescription for the "right" approach to personnel mix, or the "right" personnel mix in particular situation. As discussed in previous

chapters, the current published work on approaches to personnel mix, and evaluation of the cost/quality dimension of specific personnel mixes in healthcare is fragmentary, and does not allow any general conclusions to be drawn or specific approaches to be recommended. Even if this were to be regarded as desirable and possible (and the many contextual and organisational/political variables which have to be considered suggest it may not), the review of the published literature available for this paper does not provide sufficient weight of evidence or unchallengeable results to formulate recommendations. What can be done is to determine general principles and guidelines for managers and professionals determining personnel mix (as outlined in Chapter 2) and provide a framework for informing decisions on approaches to personnel mix, as discussed in this chapter.

The remainder of this section highlights the testing of the template/framework, by illustrating its application to 79 papers identified in the course of the review. This application was undertaken to check its utility and comprehensiveness in recording the main elements of reported approaches to personnel mix and to provide a framework for systematic review of the main results and conclusions of these publications. In relation to **utility/comprehensiveness**, the template/framework was found to provide scope for general applicability, as measured by its application to 79 studies and publications adopting a variety of approaches, drawn from over 13 countries. It is believed that one of the major benefits of the template/framework could be in assisting to build up country specific and context specific information drawn from published **and** unpublished reports. The authors of the paper are aware from their own experiences and from the resource and language limitations of this study, that many relevant reports and papers are not published (and therefore are not

readily identifiable through library searches from a remote location) but are publicly available within a country or health system. The template/framework provides the means of systematically documenting the relevant features and results of unpublished country or context specific papers and reports.

In relation to **systematic review**, the template/framework as illustrated in the 79 examples below serves to highlight a number of major features. Even a cursory glance through the template examples demonstrates that many published papers do not provide key data elements or information (eg information on measures of cost or quality), and that in most cases **study type** is single study or descriptive only.

Whilst a requirement for the specification of this paper was to review community health and primary care, it is evident that most studies reviewed focus on medical and surgical **specialties** in acute hospital **settings**. Non acute hospital settings, and studies examining mix in primary care and community specialties or setting are comparatively rare. Given the general preponderance of studies from USA reviewed in this paper, the under-reporting of primary care is not surprising.

Personnel **mix** under review is most often qualified nurse/doctor, or qualified/unqualified nurse. **Size** and **numbers of staff** is often not available, which prevents drawing any conclusions about the differential effects of different mixes or ratios of staff. Furthermore **outcome** and **tool** details are often limited or non

existent; where measure of outcome are reported, these are often primarily proxy measures relating to reported staff satisfaction or patient satisfaction.

Finally, **sample sizes** are often very small, limiting the relevance of conclusions and results, and **cost measures** are not always provided.

Application of the template serves to highlight the specific strengths and weaknesses of specific studies of, and reported approaches to, personnel mix. At aggregate level, the template also provides a systematically derived overview of the main strengths, limitations, common features and differences, of the group of studies/ publications to which it is applied. It assists in identifying major gaps and shortcomings (which at present include few studies measuring **outcome** and **cost**; many studies using small sample sizes) but also provides ready access to key information on a range of potential approaches to personnel mix.

5. Overview

This report has highlighted the reasons why achieving the "right" personnel mix is important, has outlined different approaches to determining personnel mix, has reviewed the literature, and has described a research-based approach to reviewing approaches to determining personnel mix. It is apparent from the findings of the report that four major conclusions can be drawn:

- there is no single "correct" way to determine the "right" personnel mix; a number of options are available, each of which has strengths and weaknesses
- most of the published studies evaluating the effects of different personnel mixes are narrow in focus, small in sample size and short in timescale
- it is not possible to derive any generalisable indicators or lessons from available research, partly because the research base is fragmented, partly because the organisational context of each study is different, with many contributory (and potentially confounding) variables
- in order to achieve a more robust series of guidelines and "lessons" on determining personnel mix, there is a need to standardise methodologies, replicate studies and network results

Underlying these conclusions are a number of contextual factors which are rarely made explicit or enumerated in studies in personnel mix. These are organisational

structure, labour market dynamics, training/education implications, and the "specialist versus generalist" debate.

It was noted in Chapter 2 that studies of personnel mix are often undertaken as a precursor to (or a stimulus for) organisational change. Many studies focus on the level of the employing unit and fail to fully explore alternatives to changing personnel mix. These could include exploring the questions "would a different pattern of employment of current staff achieve similar objectives?"; "what would be the effect on cost and quality of decentralising or centralising of support services, or "contracting out" of support?" Furthermore, the 'knock-on' effect of changes in personnel mix, and the interdependence of issues of staffing levels and mixes with these organisational factors is rarely evaluated.

Labour market dynamics are also likely to play a part in personnel mix - either in terms of demand for appropriately skilled staff (eg a skills shortage may be the 'driver' for change in personnel mix), or because a supply constraint may limit the potential for changing personnel mix (eg an organisation may decide to alter personnel mix, and find it cannot recruit suitably skilled "new" workers).

This points to the need, at micro- and macro- level, for an awareness of the links between labour market dynamics and the determinants of personnel mix, and for

workforce planning mechanisms to take account of trends in demand for various types of skills.

In relation to training, the need for close collaboration between health sector employing organisations and education and training "providers" is highlighted, to ensure that any significant proposed changes in personnel mix are accounted for in curricula and training targets. In addition, it has to be recognised that any such significant changes in roles of health personnel may be constrained by professional regulation and/or legislative barriers. Any attempt to evaluate the cost/quality dimensions of changing personnel mix should attempt to assess training costs. It is likely that depending on who is paying for training (individual staff?; the health sector employer?; public funded education sector?), there will be a different pattern of training uptake, and a different level of impact on the acquisition of new skills or development of new roles.

The issue of "specialist vs. generalist" is at the heart of the debate on personnel mix in healthcare, for determining the "right" mix is not just about exploring the balance between professions or staff groups, but the divisions within them. In some healthcare systems there is a trend towards using generalist "multiskilled" workers. It is argued that this can reduce the requirement for staff, simplify the processes of delivering healthcare, improve access and enhance distribution of skills. However, for a complete evaluation of the potential benefits of multiskilling to be achieved,

associated factors have also to be considered - these will include training and retraining costs, and the requirement to maintain skills and competencies across a broader range of areas of practice.

Determining the "right" profile and mix of staff is likely to present a continuing challenge to managers and professionals in any healthcare organisation. It is apparent from this review that there is also a continuing tension between the organisational priorities of implementing change and containing costs in the short term, and the need for 'objective' evaluation of the broader effects of such change in the longer term. Achieving a balance is not only about determining the "right" mix of staff as a "one off" exercise, it is about reviewing this mix, and managing the tension between cost and quality issues over the longer term.

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